

CLAIMS

I claim:

- 1 1. A method of forming diamond comprising:
2 providing a substrate in a reaction chamber in a non-magnetic-field
3 microwave plasma system;
4 introducing, in the absence of a gas stream, a liquid precursor
5 substantially free of water and containing methanol and at least one carbon
6 and oxygen containing compound having a carbon to oxygen ratio greater
7 than one, into an inlet of the reaction chamber;
8 vaporizing the liquid precursor; and
9 subjecting the vaporized precursor, in the absence of a carrier gas
10 and in the absence in a reactive gas, to a plasma under conditions effective
11 to disassociate the vaporized precursor and promote diamond growth on the
12 substrate in a pressure range from about 70 to 130 Torr.

- 1 2. The method of claim 1, wherein the carrier gas is hydrogen (H₂).

- 1 3. The method of claim 1, wherein the pressure range is from 80 to 130 Torr.

- 1 4. The method of claim 1, wherein the pressure range is from 110 to 130
2 Torr.

- 1 5. The method of claim 4, wherein the methanol is from about 50 to 96
2 weight percent of the liquid precursor.

- 1 6. The method of claim 1, wherein the methanol is from about 50 to 96
2 weight percent of the liquid precursor.

- 1 7. The method of claim 1, wherein the methanol is from about 73 to 96
2 weight percent of the liquid precursor.

- 1 8. The method of claim 1, wherein the methanol is from about 90 to 96
2 weight percent of the liquid precursor.

- 1 9. The method of claim 1, wherein the at least one carbon and oxygen
2 containing compound having a carbon to oxygen ratio greater than one are
3 selected from ethanol, acetone, isopropanol, and combinations thereof.

- 1 10. A method of forming diamond comprising:
2 providing a substrate in a reaction chamber in a non-magnetic-field
3 microwave plasma system, the reaction chamber being in fluidic
4 communication with a container through a metering valve, wherein the
5 container includes a liquid precursor substantially free of water containing
6 methanol and at least one carbon and oxygen containing compound having
7 a carbon to oxygen ratio greater than one;
8 flowing the liquid precursor into the reaction chamber using the
9 metering valve, in the absence of a gas stream flowing through the
10 metering valve entraining the liquid precursor, wherein the liquid
11 precursor vaporizes during entry into the reaction chamber;
12 vaporizing the liquid precursor;
13 subjecting the vaporized precursor to a plasma under conditions
14 effective to disassociate the vaporized precursor in the absence of a carrier
15 gas and in the absence in a reactive gas; and
16 promoting diamond growth on the substrate at a pressure in the
17 range from about 10 to 130 Torr.
- 1 11. The method of claim 10, wherein the methanol is from about 50 to 96
2 weight percent of the liquid precursor, and wherein the pressure range is
3 from 70 to 130 Torr.

- 1 12. The method of claim 10, wherein the methanol is from about 73 to 96
2 weight percent of the liquid precursor, and wherein the pressure range is
3 from 110 to 130 Torr.
- 1 13. The method of claim 10, wherein the methanol is from about 90 to 96
2 weight percent of the liquid precursor, and wherein the pressure range is
3 from 110 to 130 Torr.
- 1 14. The method of claim 10, wherein the carrier gas is hydrogen (H₂).
- 1 15. The method of claim 10, wherein the reactive gas is hydrogen (H₂).
- 1 16. The method of claim 13, wherein the carrier gas is hydrogen (H₂).
- 1 17. The method of claim 13, wherein the reactive gas is hydrogen (H₂).
- 1 18. The method of claim 17, wherein the at least one carbon and oxygen
2 containing compound having a carbon to oxygen ratio greater than one is
3 ethanol.
- 1 19. The method of claim 17, wherein the at least one carbon and oxygen
2 containing compound having a carbon to oxygen ratio greater than one is
3 acetone.
- 1 20. The method of claim 17, wherein the at least one carbon and oxygen
2 containing compound having a carbon to oxygen ratio greater than one is
3 isopropanol.
- 1 21. The method of claim 10, wherein the substrate does not include a pre-
2 deposition seeding of diamond particles on the surface of the substrate.

- 1 22. The method of claim 10, wherein the substrate is aluminum.
- 1 23. The method of claim 10, wherein the metering valve includes a
2 temperature measuring device coupled to the tip of the metering valve,
3 wherein the vaporization of the liquid precursor causes the metering valve
4 to decrease in temperature to a temperature value, wherein the temperature
5 value is correlated to a flow rate of the liquid precursor, wherein the flow
6 rate of the liquid precursor into the reaction chamber can be substantially
7 reproduced by opening the metering valve to an extent so that the
8 temperature value is obtained.
- 1 24. The method of claim 23, wherein the container includes a volume of the
2 precursor liquid at atmospheric pressure, wherein the liquid precursor is
3 adapted to be replenished during the formation of the diamond without
4 interrupting the formation thereof.